Final Report:

Microslide Cassette Programs

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Running Head: Microslide Cassette Programs

Introduction

Few microscope materials are available in biology and general science for legally blind students who have useful amounts of residual vision. Current emphasis on use of residual vision and on mainstreaming legally blind students were cited by participants in a national needs meeting in science for blind students (held in Atlanta, April 1979) in their endorsement of a microslide* project. A microslide viewer and slides were examined by participants who felt that the materials have significant utility and implications for a large number of legally blind students with useful residual vision who are mainstreamed in science classes with sighted students.

Further they supported the approach of adapting the materials for audiotutorial learning, i.e, self-instruction using prerecorded tapes which will allow the student to focus his full attention on use of the microscope (visual inspection task) without having to shift from the large print or braille page (reading task) in a complicated two-step operation.

Part I

Projective Objective

The principal objective of this project was the preparation of tapes of 20 print lessons which are currently available to sighted students in regular classes. A subordinate objective was the collection of visual legibility data to determine the value of the accompanying slide photographs for low vision students. (In a subsequent project 20 additional sets of microslide units were prepared. This phase is reported in Part II.)

*Microslide, Microslide Viewer, and Microlens are registered trademarks of National teaching aids, Garden City Park, New York.

Materials Description

The set of materials consists of 20 lessons and a microslide viewer. The lessons contain a strip of 8 microslide views and a text with a brief explanation or description of each view. Each lesson begins with a brief and simple introduction which defines, summarizes, or explains the term (or process or phase) presented. Occasional diagrammatic information appears in the lessons. The slides generally, present clear views of a variety of microscopic cross-sections and structures. Print letters, arrows, and brackets are clear and uncluttered. Individual letter size approaches 18 point.

The text presentation also includes specialized vocabulary (e.g., algae) which is spelled out and the magnification factor of what occurs on the slide (e.g., DIATOM--200x--left side). Provocative questions often are included in the lessons (e.g., How big is a virus?).

The microslide viewer is virtually unbreakable with normal use. Replacement or additional viewers can be purchased from: National Teaching Aids, Inc., 120 Fulton Avenue, Garden City Park, New York 11040 (516-248-5590). A MACRO-lens TM attachment is available which converts the viewer for use in examination of solid objects up to 3/4 inch.

The regular print text and slide views are packaged with each cassette. Each cassette is labeled in print and braille. A list of the lesson titles follows. Lesson 101, An Introduction to the World of the Microscope, should be viewed first.

Microslide Cassette Project I

No.	Title
101	An Introduction to the World of the Microscope
10	Cells of Your Body
11	Cells of Plants
53	Animal Mitosis
59	Photosynthesis
61	Embryology--The Frog
75	Animal Parasites of Man
76	The Hydra
77	The Root of A flowering Plant
78	The Stem of a Flowering Plant
79	The Leaf of a Flowering Plant
80	The Flower of a Flowering Plant
84	Fern--The Life Cycle
86	Aurelia--The Life Cycle
87	Marchantia--The Life Cycle
88	Moss--The Life Cycle
102	Cells of Plants and Animals
103	From Egg to Chick
105	Harmful and Helpful Bacteria
110	Life in a Pond

Materials Evaluation

Some 80 sets of microslides were reviewed by three experts. 20 sets with representative views of plant and animal cross-sections and structures found in the basic science curriculum were selected. Visual clarity of the slide contents also was a criterion for selection. Content for each unit was edited and recorded for field evaluation. Components for teacher evaluation were specified and evaluation sites were identified for a teacher critique-in-use of the materials. These components include: (a) screening/familiarization activities with student response sheets, and (b) procedures for field evaluation of the 20 sets of slides and tapes with student microslide evaluation sheets. These components were used and reviewed by an elementary teacher of blind students to determine their clarity and usability. Initial field trials using Kentucky School for the Blind students also were conducted by the teacher (with the project director) to pinpoint specific weaknesses in the teacher evaluation materials. The materials were edited, a visual legibility test was prepared and piloted, and a tentative teacher information packet prepared.

Visual legibility testing of the microslides was conducted with more than 45 low vision students from grades 5-12. (A set of the materials are included in Appendix A.) Performance was found to exceed the criterion that 70% of the legally blind students classified as print readers would score 85% or higher on the 30-item array of letters, symbols, and structures randomly selected from the slide views. A breakdown for letters and symbols and for structures is presented in Table 1. Since near point acuities were not available, preliminary near vision screening of the students was required. This screening employed use of the Lighthouse Near Acuity Test designed with Sloan letters for testing vision

at 16 inches. The screening instrument was the quickest and easiest available to administer. (It yields a Snellen fraction which can be converted to an approximate Jaeger type designation or to approximate printer point sizes.) Although this screening device lacks the precision of that used by the medical profession, it afforded a common base comparing and analyzing student performance using the microslides.

Student and Teacher Interviews

Interview reports from teachers using the slides with students in public school programs were most positive with some teachers indicating that even totally blind students were able to profit from information on the accompanying tapes. (A composite of Interview/Evaluation reports is included in Appendix B.) Teachers in residential and public school programs reported that students saw more through the viewer than they expected. One enterprising teacher used an Apollo (magnifier) viewer to show on a screen what a student (who had never used such a viewer) was supposed to see. Once the student understood the task and identified letters and structures on the Apollo viewer, she was able to use the micro-slide viewer. Another student with very low vision alternated between use of an overhead projector and the microslide viewer. Acceptance was unanimous and enthusiastic among residential and public school teachers and students--sighted and visually handicapped--who used the materials.

A report from a teacher who used the materials with 9 legally blind (low-vision) students in the Pasadena Unified School District (California) supported the inclusion of all units for production. She reported that the taped content "has been excellent for all students." The major problem

seemed to be the limited background in science of the participants. Students experienced difficulty with the scientific vocabulary which impeded the independent use of the materials. Spanish speaking students experienced additional difficulties. For these students, small group discussions and presentations were more effective. The teacher's final comment: "Overall, the tapes are great! Everybody wanted to use them. What more can we ask for?"

Science students at the Georgia Academy for the Blind (Macon) reviewed the microslides and tapes to determine if any unit should be excluded from the set of 20. Although there were comments and suggestions, students recommended that all units be included. The combination of tape and slide made each unit a valuable supplementary science material.

The students were highly motivated. They provided a number of suggestions and observations in individual and group interviews.

1. When the microslide units paralleled textbook assignments, students used the microslide units as overviews and/or summaries because of the brevity and conciseness of information presented on the tapes. These students included some blind students with no useful residual vision.

2. Students, including totally blind students, used a human torso in the classroom to identify organs of the respiratory system and the digestive system as they listened to tapes related to these systems.

3. Totally blind students who had been through the Cell Division ATRM program recalled coiling of the chromosomes (Set 81). They requested accompanying models similar to the ATRM tactile schematics.

4. Braille students also requested that we put braille labels on each unit to facilitate independent use by braille students. A number of braille, legally blind students who could not read the print letters, were able to see a number of the slide views with the greatest figure-ground contrast.

5. Some low vision students used high intensity lighting on the microviewer stage.

6. Several students who were not able to read or see letters and lines were able to find numerous structures on the slides. For confirmation, the teacher had students draw or sketch what they saw. Although some of the sketches were poor, they did indicate that these students were able to see a number of the structures well enough to identify them from the taped descriptions.

7. Some students utilized, along with high intensity lighting, the use of a paperweight magnifier with the viewer. This application further improved ability to see structures and letters--more often the ability to recognize structures.

8. A few of the students who are color blind were able to use the slides and to sketch structures they saw.

9. All students liked the units--their brevity--and especially, the spelling out of scientific terms.

10. Students thought the diagrams included in the print units were helpful. They used magnifiers to study these diagrams.

11. One student suggested that sketches--about twice the size of the microslide view--be made of each slide, including the most important structures.

12. Students requested that we investigate the projection of the slides on flat surface, from underneath, about twice the size of the slide view.

13. Some students successfully used the slides with the Visualtek visual aid.

14. The major problems that low vision students had were related to some slides being too dark, dim, or cluttered and the letters and numbers too small.

Part II

Microslide Project--Level 2 (Continuation)

In response to demand for additional microslides, 20 additional sets were tested from those meeting the original criteria for selection. These slides present an overview of life functions ranging from one-celled organizms to complete human systems. Content for each unit was edited and recorded for field evaluation. Components for teacher evaluation were specified and evaluation sites were identified for a teacher critique-in-use of the materials. Level II utilized the same evaluation procedures outlined by Level I. The list of microslide titles follows this section.

Visual legibility testing was conducted in early 1981. 30 low vision students from grades 7-12 participated. The advanced grade level corresponded with the advanced content of the set of slides. Testing focused on identifying structures as a means of indicating the clarity, color, and legibility of the slides. The findings are presented in Table 2.

An article, "Microslide Cassette Programs for Low Vision Students," was prepared and submitted for publication in February 1983. A copy of this article appears in Appendix C.

Microslide Cassette Project II

No.	Title
82	Non-Green Plants--Heterotrophic Nutrition
201	Algae
202	Protozoa
21	How Living Things Breathe
52	Excretion
104	How a One-Celled Animal Divides
57	Skin
71	The Endocrine System
112	Your Life and Breath
113	Your Circulatory System
114	Your Nervous System
70	The Reflex Arc
116	Your Digestive System
95	Human Blood
51	Animal Tissues
204	Body Defenses Against Infection
74	Parasitism--A Way of Life
73	Smoking and Health
81	Chromosomes and Genes in Action
203	Life Functions (Paramecium)
205	Evolution Under the Microscope (alternate/substitute to list above)

Table 1

Microslide Cassette Project I

Legibility Scores *

(N=47)

	Text No.	Slide View	% Correct Response		Text No.	Slide View	% Correct Response
1.	105	6	83.0	16.	53	4	44.6
2.	79	3	97.8	17.	10	5	85.1
3.	103	3	95.7	18.	10	4	91.4
4.	60	3	93.6	19.	105	1	80.8
5.	53	5	95.7	20.	105	1	80.8
6.	11	8	89.3	21.	105	1	82.9
7.	86	4	91.4	22.	75	4	97.8
8.	86	8	95.7	23.	75	5	93.6
9.	88	2	55.3	24.	75	5	97.8
10.	88	3	63.8	25.	85	1	100.0
11.	10	7	95.7	26.	85	2	93.6
12.	80	4	95.7	27.	85	6	89.3
13.	76	6	97.8	28.	76	4	87.2
14.	77	3	82.9	29.	76	8	100.0
15.	77	7	85.1	30.	80	7	95.7

* The APH criterion for student performance was that 70% of the sample would score 85% or higher. The overall mean score of the sample is 89.4%. The top 70% of the sample, however, achieved a mean score of 98.1%.

Table 2

Microslide Cassette Project II

Legibility Scores *

(N=30)

	Text No.	Slide View	% Correct Response		Text No.	Slide View	% Correct Response
1.	95	3	66.7	11.	201	5	83.3
2.	95	8	100.0	12.	201	5	93.3
3.	202	2	53.3	13.	201	1	86.7
4.	202	7	93.3	14.	201	6	100.0
5.	202	8	83.3	15.	21	5	100.0
6.	104	7	96.7	16.	82	7	100.0
7.	205	5	50.0	17.	113	1	93.3
8.	205	3	83.3	18.	70	1	100.0
9.	205	7	96.7	19.	73	6	100.0
10.	57	5	76.7	20.	204	6	100.0

* The APH criterion for student performance was that 70% of the sample would score 85% or higher. The overall mean score of the sample is 87.7%. The top 70% of the sample, however, achieved a mean score of 93.6%.

APPENDIX A

SCREENING/FAMILIARIZATION ACTIVITIES FOR THE MICRO-SLIDE VIEWER (SET 101)

To the Teacher

This lesson on use of the microscope has been adapted for teacher use with students as a screening device and as an information base for evaluating the appropriateness of the materials for use by low vision students. It also serves as a familiarization-for-use mini-program for students.

The edited lesson with slide views provides the teacher with information on what the student is able to see using the micro-slide viewer. Print Diagrams 101-1, 101-2, and 101-3 are visual screening materials to determine if the student has sufficient useful residual vision to use the viewer. If, for example, the student cannot identify the insect parts on Diagram 101-1 or read the letters on Diagram 101-2, it is not likely that he will be able to identify letters, symbols, and structures on the slides. If the student is able to perform a number of the tasks using Diagrams 101-1 and 101-2, you can proceed.

Diagram 101-3 is a response training device. It provides an orientation to vocabulary and location of letters and symbols in each of four sections on the microslide. The student can respond or locate items using the following terminology: Near left, near right, far left, or far right sections of the slide view. This vocabulary has been successful with young blind and low vision students in numerous APH studies. The teacher can utilize this information in determining the kinds of things (structures) that the student is able to identify and locate using the micro-slide viewer.

These materials familiarize the student with the micro-slide viewer and the slides. They provide practice activities for identifying and locating letters, symbols, and structures used in comprehending the lesson content. The procedure facilitates the students' subsequent independent use of the viewer, the slides, and the accompanying tapes.

Use the yellow sheet for recording student responses in these activities.

SET 101 AN INTRODUCTION TO THE WORLD OF THE MICROSCOPE

When you walk home from school, you may pass things as large as a building or as small as an ant. There are many objects about us so small we cannot see them with our eyes alone. An instrument that helps the eyes to see these tiny objects is the microscope. The microscope has become the most important tool of scientists studying what we call microscopic life. Thousands of different plants and animals have been identified that are invisible to the unaided eye.

It is the lens in a microscope that enlarges structures so our eyes can see them more clearly. A lens is a piece of glass with polished curved surfaces. When light passes through the lens, the rays of light bend. Here is an example. Look at this drawing (101-1). (When the student has looked at the drawing, hold it vertically and explain that he will be looking down when he uses the micro-slide viewer.) Pretend that you are looking through a microscope at an ant. The arrow shows from where you are looking and the direction. (Now place the sheet on the table in front of the student, as before.)

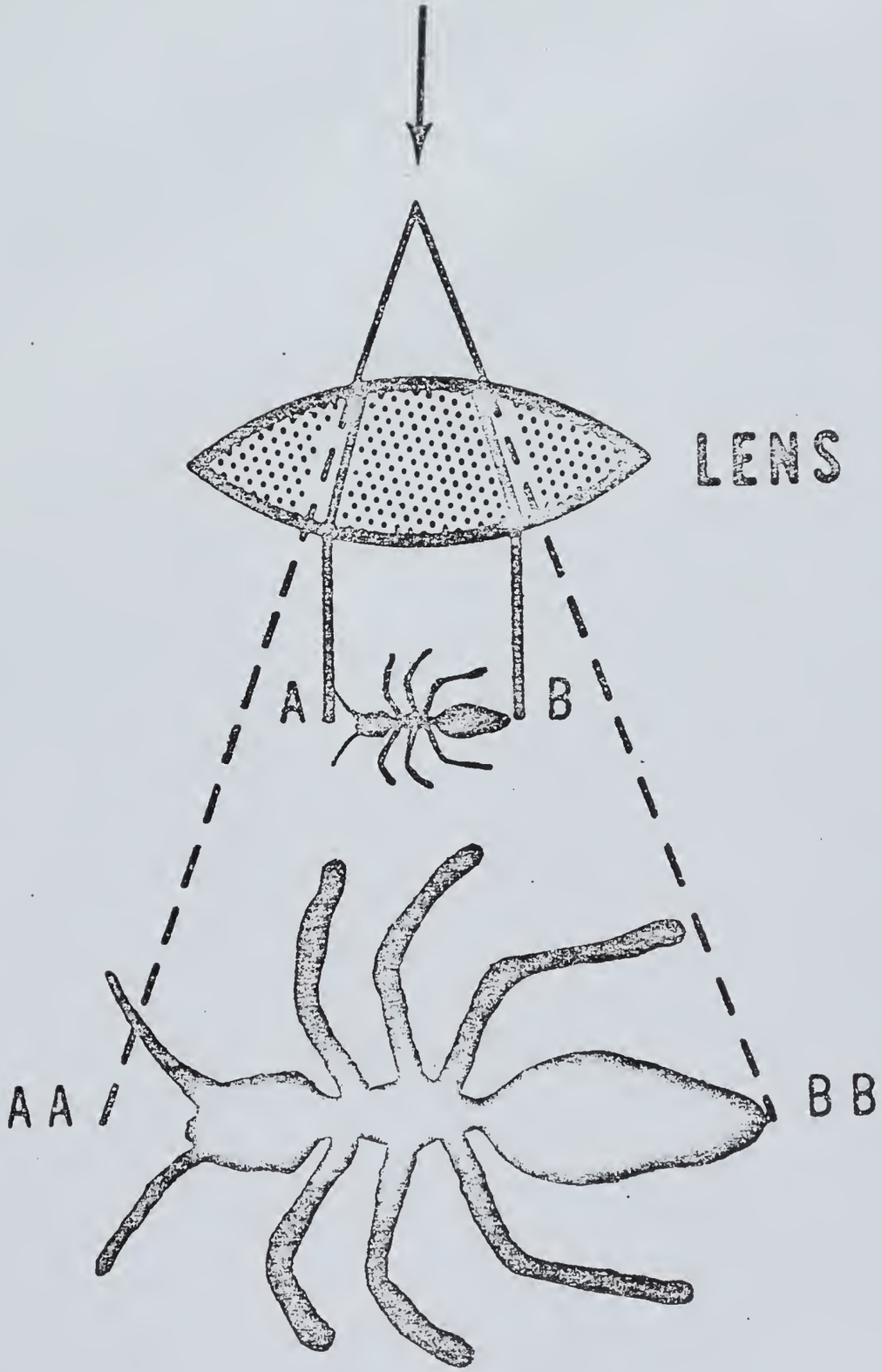
Show me the arrow. Is it pointing toward or away from you? (1) Toward. If you place an ant on points A and B, and look at it through a lens, the ant will appear larger. Show me point A. (2)_____ Show me point B. (3)_____

Why will the ant appear larger through a lens? The light coming from Point A bends and appears to be coming from point AA. Show me point AA. (4) _____ The light from B appears to be coming from point BB. Show me point BB. (5)_____ Because the lens bends the light rays, the ant you are looking at seems to be much larger.

*Show me the head of the small ant. (6)_____ How many legs are there on the small ant? (7) 6 Can you find the antennae or feelers on the small ant? (8)_____ How many are there? (9) 2

(If the student can answer items 1 through 6 correctly, proceed to the next section.)

* If the student cannot see the small ant, use the large ant for items 6-9.


LENS
A
B
AA
BB

There are 10 rows of letters on the sheet I have placed in front of you. Here is a marker if you wish to use it. Each row is numbered. Can you find the numbers from 1 to 10 along the left side. Point to each number with your finger and read it out loud as you count from 1 to 10.

1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10

Find the first row of letters across the page. Read the letters in Row 1 to me.

A - B - C - D - E

Find the second row of letters. Read the letters in Row 2 to me.

D - E - F - G - H

Find the third row of letters. Read the letters in Row 3 to me.

G - H - I - J - K

Find the seventh row of letters. Read the letters in Row 7 to me.

R - S - T - U - V

Find the ninth row of letters. Read the letters in Row 9 to me.

Y - Z - A - B - C

(The letters in Lines 1 and 6 are approximately 18 point; those letters in lines 2, 4, and 7 are 16 point; and those in lines 3, 5, 8, 9, and 10 are 14 point. The letters on the slide views are nearer 16 point. Since they appear individually, students may be able to recognize them on the slides. If the student is able to identify 70% of the 16 point letters (7 out of 10), you may wish to proceed.)

(The sheet of circles is to introduce vocabulary and is not a visual screening device.)

1. A B C D E
2. D E F G H
3. G H I J K
4. H I J K L
5. K L M N O
6. N O P Q R
7. R S T U V
8. V W X Y Z
9. Y Z A B C
10. D E F G H

There are five circles on this sheet of paper that I have placed in front of you. Find the circle in the middle of the sheet. Now, I want to ask you some questions about the other circles.

Pretend that the sheet is divided into four sections. There is a circle in the near left section. Show me the circle.

1) There is a circle in the near right section. Show me the circle.

2) Find the circle in the far left section.

3) Now, find the circle in the far right section.

4) Which circle has the large "E" in it? The near right, the near left, the far left, or the far right circle?

5) Which circle has the smaller "E"?

6) Which circle has the large "L"?

7) Which circle has the smaller "L"?

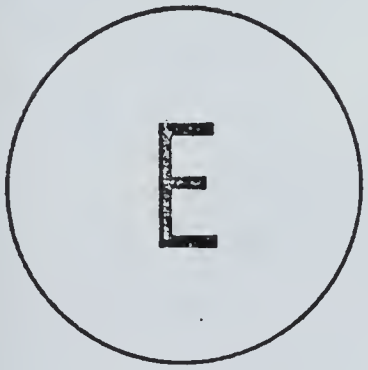
In the middle of the sheet there is a circle divided into four sections. A near right section, a near left section, a far left section, and a far right sections. Which section had the letter "E" in it? (8)

9) Which section has the letter "R"?

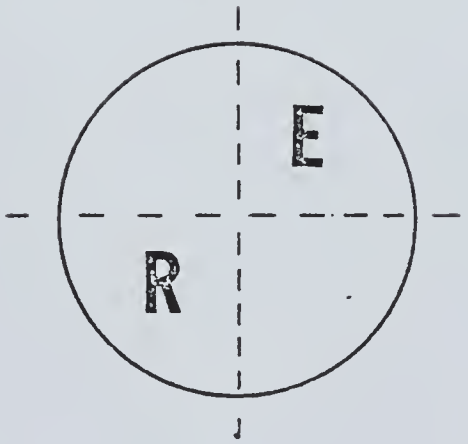
10) Show me the near right section of the circle.

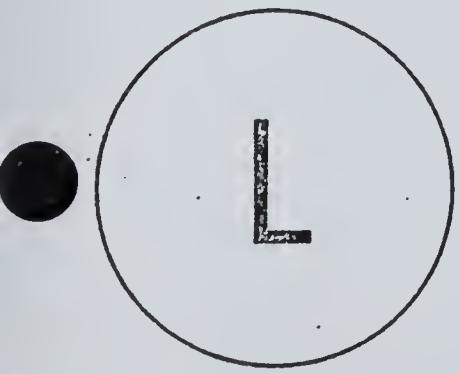
11) Now, show me the far left section of the circle.

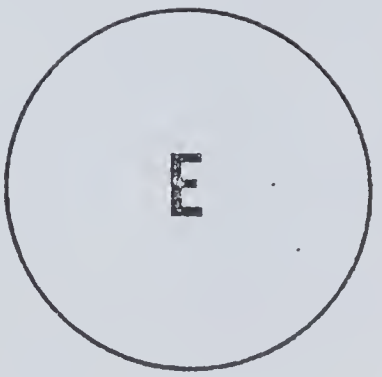
(If the student was able to read the 16 point letters on the previous diagram, but has difficulty with the vocabulary as locational referents, you may wish to provide additional practice on the diagram before proceeding to use of MICRO-SLIDE 101.)


E

L


E
R


L


E

AN INTRODUCTION TO THE WORLD OF THE MICROSCOPE (SET 101)

MICRO-SLIDE 1. THE LETTER "e" - (10x)

Look at Slide 1 in your Micro-Slide Viewer. What letter do you see in the photograph? (1) The letter "e". The letter "e" has a closed and an open side Is the closed side of the "e" on the near or far side of the slide? (2) Far side. Is the open side on the left or the right side of the letter "e"? (3) Right side.

Can you find the number "1"? It is white on a background. In what section is the number? The near left, the near right, the far left, or the far right section? (4) The near right section.

MICRO-SLIDE 2. POLLEN--Stained - (40x)

Where is the number of the slide found? (5) Near right corner. Pollen grains magnified 40 times are shown on the slide. The large green structures that look like golf balls are from the ragweed plant which causes the most common type of hay fever. Are the large green structures on the left or the right side of the slide. (6) On the right. How many are there? (7) Three.

The large reddish brown grains are sunflower pollen. Are the reddish brown structures on the left or the right side? (8) On the left. How many are there on the slide? (9) Two.

MICRO-SLIDE 5. BLOOD CELLS--Stained - (500x)

This slide shows a large number of red blood cells and two larger white blood cells at A and at B. Is the letter "A" on the right side or the left side of the slide? (10) Right side. Is it on the near or far side of the slide? (11) Far side. Is the letter "B" on the left or the right side? (12) Left side. Are the black straight lines on the left or the right side of the letters A and

B? (13) Left side.

MICRO-SLIDE 7. EARTHWORM--Cross-section - Stained - (8x)

This is a cross-section of an earthworm. Cross-sections make it possible to see inner structures of animals or plants in a microscope. Which letter is in the near left section? (14) The letter "M". Which letter is in the far right section? (15) The letter "B". Which letter is in the far left section? (16) The letter "I".

MICRO-SLIDE 8. VIRUS--(100,000x)

The electron microscope has been used to enlarge the viruses on this photograph 100,000 times. If we divide this slide into four sections: Near left, near right, far left, and far right, which sections show photographs of viruses? (17) The near left and (18) The far right. Which section shows two viruses? (19) The near left.

MICRO-SLIDE VISUAL LEGIBILITY TEST

Part I: Letters and Symbols

78/4 1) In what section of the slide is the shortest black line found? The near right, the near left, the far left, or the far right section?

105/6 2) Where is the arrow on this slide? In the near right, the near left, the far left, or the far right section?

79/3 3) In what section of the slide is the letter "E" found? In the near left, the near right, the far left, or the far right section?

103/3 4) In what section of the slide is the letter "A" found? In the near left, the near right, the far left, or the far right section?

60/3 5) Where is the arrow found on the slide? In the near right, the near left, the far left, or the far right section?

53/5 6) Where is the black line on the slide? In the near right, the near left, the far left, or the far right section?

11/8 7) In what section of the slide is the letter "C" found? In the near right, the near left, the far left, or the far right section?

86/4 8) In what section of the slide is the letter "B" found? In the near right, the near left, the far left, or the far right section?

86/8 9) Where is the black line on the slide? In the near right, the near left, the far left, or the far right section?

88/2 10) Here is a symbol. (Show the student the symbol.) Where is it on the slide? In the near right, the near left, the far left, or the far right section?

88/3 11) Here is another symbol. (Show the student the symbol.) Where is it found on the slide? In the near right, the near left, the far left, or the far right section?

10/7 12) In what section of the slide is the letter "B" found? In the near left, the near right, the far left, or the far right section?

80/4 13) In what section of the slide is the letter "O" found? In the near left, the near right, the far left, or the far right section?

76/6 14) In what section of the slide are the letters "B" found? In the near left, the near right, the far left, or the far right section?

77/3 15) Where is the shortest black line found? In the near left, the near right, the far left, or the far right section of the slide?

77/7 16) Where is the black line on this slide? In the near left, the near right, the far left, or the far right section?

Part II: Structures

11/2 17) Can you find the leaf vein? It is continuous. That is, it is not broken into segments like rows of cells on the slide. Where is the leaf vein on the slide? (V--near to far across the slide)

53/4 18) How many worm-like structures are there in the center of the cell on this slide? (4)

10/5 19) Do the long ribbon-like structures in this slide appear to be solid or spotted? (spotted)

10/4 20) Does the line from the letter "B" to the middle of the slide point to a light or dark spot? (dark)

105/1 21) There are three kinds of bacteria on this slide. Some are shaped like round dots; some are shaped like short, straight rods; and a few are shaped like a crooked line. I want to ask you some questions about them. There is one with a dark crooked shape. Is it on the left or the right side of the slide? (right side)

22) Some are shaped like short, straight rods. Are they on the far or the near side of the slide? (near side)

23) Some look like dark round dots which are very close together. Where are they located? On the near or the far side of the slide? (far side)

75/4 24) There is a blue or purple stained spot on the slide. Is it in the near left, near right, far right, or far left section of the slide? (near left)

75/5 25) and 26) The letter "O" is pointing to a bulge on the wall of the stomach of a magnified mosquito. I will name the sections on the slide. I want you to tell me when I name a section(s) which shows another bulge. Near right section, far right section, far left section, near left section. (far right, near left sections)

85/1 27) How many structures are there on this slide? (3)

85/2 28) Are the hairlike lines on the near side or the far side of this structure? (far side)

85/6 29) This tiny animal has a number of arms reaching out from the center of its body. How many of them can you count? (8)

76/4 30) How many string-like structures are shown on this slide? (2)

76/8 31) This slide shows a magnified view of a hydra. How many large dark spots are there attached to the hydra? (2)

80/7 32) This slide shows two structures. One is curved and one is straight. Is the straight on the right or on the left side of the slide? (right side)

Date_____

ent Code Number_____ Birthdate_____ School System_____

Cause of blindness_____ Onset_____

Distant Visual Acuity_____ Rt_____ Left_____ (Screening

Near Visual Acuity_____ Rt_____ Left_____ Instrument

Spectacles Prescribed: Yes_____ No_____ Wearing_____

Circle one:
Color blind: Yes No
Color Deficiency:

Reading medium: Braille_____ Large Type_____ Standard Type_____ None_____

Other relevant information:_____

_____

_____

Evaluator_____

Please use the following space for evaluation comments.

Microslide Legibility

Student ID#_____

Student Consent Yes/No

	Correct	Incorrect		Correct	Incorrect
1.	_____	_____	17.	_____	_____
2.	_____	_____	18.	_____	_____
3.	_____	_____	19.	_____	_____
4.	_____	_____	20.	_____	_____
5.	_____	_____	.	_____	_____
6.	_____	_____	.	_____	_____
7.	_____	_____	.	_____	_____
8.	_____	_____	.	_____	_____
9.	_____	_____	.	_____	_____
10.	_____	_____	.	_____	_____
11.	_____	_____	.	_____	_____
12.	_____	_____	.	_____	_____
13.	_____	_____	.	_____	_____
14.	_____	_____	.	_____	_____
15.	_____	_____	.	_____	_____
16.	_____	_____	.	_____	_____

Observations/Comments:

MICROSLIDE CASSETTE PROGRAM II

OUTLINE OF EVALUATION PROCEDURE

I. Screening/Familiarization Activities:

1. Welcome the student. Examiner introduces himself.
2. Read opening paragraphs (below). Answer questions.
3. Proceed with the activities under "An Introduction to the World of the Microscope." (Also below)
4. Record responses (hand placement and verbal replies) on response sheets. Performance criteria for each activity is in parentheses following each activity.
5. If student meets screening criteria, administer Near-Point Acuity test.

II. Microslide II Legibility:

1. Tell the student there are more slides you'd like him to look at while you ask some questions about each.
2. Read Item 1 from Microslide Cassette Program II.
3. Record response as indicated on Response Sheet.
4. Repeat procedure for remaining slides.

OPENING PARAGRAPHS

At the American Printing House for the Blind we are developing some materials in science and biology to be used by students with low vision. We call this project the Microslide project, because it consists of pictures taken through a microscope and seen through a viewer that resembles a microscope. Before we send these materials out to students across the country, we want to be sure that they are good materials and that students can identify the features on the Microslides. Do I have your permission to use you in this evaluation?

Proceed to "Set 101: An Introduction to the World of the Microscope."

95/3 This slide shows three different kinds of blood cells. One cell has one large dark body embedded in it. Is this cell on the near or far side of the slide? Near

95/8 The blood cells on this slide are all stained with purple stain. One blood cell is larger and darker than the others. In which section of the slide is it found, near right, near left, far right, or far left? Near Left

202/2 The animal shown on this slide has a long spiral-like tail. Does the tail extend into the near left, near right, far left, or far right section of the slide? Far Right

202/7 This tiny animal has two blue arms extending from it. One arm is long, the other is short. In which section of the slide is the short arm of this animal, near right, near left, far right, or far left? Near Left

202/8 How many structures are shown on this slide? (6)

104/7 How many structures are shown on this slide? (2)

205/5 How many large round structures are shown on this slide? (6)

205/3 How many structures are shown on this slide? (5)

205/7 This slide shows two flatworms. One flatworm is stained red? Is the red flatworm found on the left or the right side of the slide? Right

57/7 This is a picture of hair follicles. The hair is rooted deep in the tissue of the skin. Is the point where the hair is outside of the skin in the near left, near right, far left, or far right? Far Left

201/5 This tiny cell has a tail extending from one end. In the body of the cell there is a light spot. Is the light spot in the body of the cell in the near right, near left, far right or far left? Far Left

201/5 What section of the slide contains the tail? Near Right

201/1 This slide shows two glowing objects. In what section of the slide is the smaller glowing object found, near left, near right, far left, or far right? Far Right

201/6 How many structures are shown on this slide? (3)

21/5 This slide shows a picture of insect air tubes. As the tube crosses the slide it divides into two branches. Is the side with the branches on the left or right side of the slide? Left

82/7 This slide shows a cross-section of a plant. There are two bluish colored structures on one side. Are they on the left or right side of the slide? Left

113/1 This slide shows some of the many cells found in a drop of blood. Two of the cells are much darker than all the rest. Are these two dark cells on the near side or the far side of the slide? Far

70/1 Is the dark border-like structure on the near side or far side of the slide?

Far

73/6 Is the dark area on this slide found on the near or far side of the slide?

Near

204/6 This slide is divided into two sections. One section is stained red, the other is stained blue. Is the blue stained section on the left or right side of the slide? Right

APPENDIX B

MICRO-SLIDE MATERIALS--Interview/Evaluation Form

Please check YES or NO in the appropriate column to indicate your response to each question. If your response is negative, please give reasons and suggestions for improvement in the space provided at the right.

I. Screening/Familiarization Activities

	YES	NO	SUGGESTED REVISIONS AND COMMENTS
A. To the Teacher Section			
1. Provides essential information	___	___	
2. States instructions/information clearly.	___	___	
3. Follows a logical sentence.	___	___	
B. Insect Parts Section (Diagram 101-1)			
1. The size and range of insect parts are sufficient for screening students.	___	___	
2. The items referring to insect parts and letters are adequate for screening purposes.	___	___	

MICRO-SLIDE MATERIALS--Interview/Evaluation Form

Please check YES or NO in the appropriate column to indicate your response to each question. If your response is negative, please give reasons and suggestions for improvement in the space provided at the right.

	YES	NO	SUGGESTED REVISIONS AND COMMENTS
C. Letters and Numbers Section (Diagram 101-2)			
1. The size and arrangement of letters is sufficient for screening students.	___	___	
2. The items are adequate for screening purposes.	___	___	
D. Circles Section (Diagram 101-3)			
1. The circle arrangement, with letters, is sufficient for screening students.	___	___	
2. The items are adequate for teaching students locational referents for screening purposes.	___	___	

MICRO-SLIDE MATERIALS--Interview/Evaluation Form

Please check YES or NO in the appropriate column to indicate your response to each question. If your response is negative, please give reasons and suggestions for improvement in the space provided at the right.

	YES	NO	SUGGESTED REVISIONS AND COMMENTS
E. Introduction--Section (Set 101)			
1. The slide views selected were adequate/representative.	___	___	
2. The activities are appropriate for teaching students to locate symbols and structures on the slides.	___	___	
F. Activities/Overall			
1. The Screening/Familiarization Activities are adequate and appropriate for screening purposes.	___	___	
2. The Activities served to some extent as a training program to teach students how to use the micro-slide viewer and the slides. (To what extent?)	___	___	
3. Students were ready to use the micro-slide viewers, independently with the cassette tapes, when they completed the activities.	___	___	

MICRO-SLIDE MATERIALS--Interview/Evaluation Form

Please check YES or NO in the appropriate column to indicate your response to each question. If your response is negative, please give reasons and suggestions for improvement in the space provided at the right.

II. The Micro-Slides and Cassette Tapes

	YES	NO	SUGGESTED REVISIONS AND COMMENTS
G. Micro-Slides			
1. The micro-slides were appropriate for the students who had sufficient residual vision to use them.	___	___	
2. The micro-slides were highly motivating for these students.	___	___	
3. The micro-slides encouraged students to ask questions and to seek additional information.	___	___	
H. Tapes			
1. Lead-in time is adequate	___	___	
2. Pauses are of sufficient length.	___	___	
3. The reader's voice is acceptable.	___	___	
4. Overall quality of the tapes is adequate.	___	___	

Did you have blind students who used only the tapes? What were their reactions to the tapes?

Please check YES or NO in the appropriate column to indicate your response to each question. If your response is negative, please give reasons and suggestions for revision in the space provided at the right.

III. Labeling and Packaging

	YES	NO	SUGGESTED REVISIONS AND COMMENTS
I. Labeling and Packaging			
1. Labeling of materials is adequate for self-instruction.	___	___	
2. Packaging of the materials is adequate for independent use.	___	___	

3. Describe packaging that will make the materials better for independent use.

IV. Overall Recommendations

J. Overall Evaluation

1. What recommendations do you have for use of the materials by low vision students?

2. What recommendations do you have for use of the materials by blind students with minimum residual vision and for those with none? Is the tape content alone of quality that is of value as a reference or supplementary material to these students?

3. What is your overall recommendation for use of the materials for the purpose intended--supplementary and/or reference materials in science?

APPENDIX C

Microslide Cassette Programs for Low Vision Students

Frank L. Franks and Robert Glass

American Printing House for the Blind

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Running head: Microslide Cassette Program

Few microscope materials are available in the areas of biology and general science for legally blind students who have useful amounts of residual vision. Current emphasis on use of residual vision and mainstreaming of legally blind students were cited by participants in a national needs meeting in science for visually handicapped students (held in Atlanta, April 1979) in their endorsement of a microslide project (Franks, 1980). A Micro-Slide-Viewer™ and slides were examined by participants, who felt that the materials have significant utility for a large number of visually handicapped students in science.

Further, participants supported the approach of adapting the microslide materials for audio-tutorial learning (i.e., providing self-instructional tapes which allow the student to focus his full attention on use of the microscope without having to shift to and from a large type or braille page in a complicated two-step operation).

The principal objective of this project was the preparation of recorded tapes of the print lessons which accompany each strip of Microslide™ views, specially edited for use by low vision students, many of whom are mainstreamed in regular science classes.

Materials Description

Two sets of materials were developed, each consisting of 20 lessons presented in regular print and on cassette tapes, and a Micro-Slide-Viewer™. Individual lessons contain a strip of 8 Microslide™ views with a brief explanation or description of each view. The slide photographs clearly present a variety of microscopic cross sections and structures. Print letters,

arrows, and brackets are distinct and unobtrusive. Individual letter size approaches 18 point. Each lesson begins with a simple introduction which defines, summarizes, or explains the object (or process or phase) presented. Diagrammatic information occasionally appears in the lessons.

The text presentation also includes specialized vocabulary (e.g., algae), which is spelled out, and the magnification factor of what appears on the slide (e.g., DIATOM--200x--left side). Provocative questions often are included in the lessons (e.g., How big is a virus?).

Contents of the Programs I and II Microslide™ lessons present an overview of a variety of life functions, ranging from one-celled organisms to photosynthesis and plant life cycles; from pond life to human respiration and digestion; and from frog embryology to body defenses against infection. Each cassette is labeled in large type and braille.

The Micro-Slide-Viewer™ is virtually unbreakable with normal use. Replacement or additional viewers are not separately available from the American Printing House for the Blind, but can be purchased from: National Teaching Aids, Inc., 120 Fulton Avenue, Garden City Park, New York 11040. A Macro-lens™ attachment also is available from National Teaching Aids which converts the viewer for use in examination of solid objects up to 3/4 inch high.

Materials Evaluation

Some 80 sets of Microslides™ were reviewed by three experts. Forty sets of representative views of plant and animal cross sections and structures found in basic science curricula were selected, partly on the basis of their visual clarity. Field evaluation sites were identified and criteria for evaluation of the materials specified.

Visual legibility testing of the Microslides™ was conducted with more than 75 low vision students from grades 5-12. Performance exceeded the criterion that 70% of the legally blind students classified as print readers would score 85% or higher on the 30-item legibility test array of letters, symbols, and structures randomly selected from the slide views. For Program I materials the overall mean score of the sample was 89.4%, with the top 70% of the sample achieving a mean score of 98.1%. For Program II materials the overall mean score was 87.7%, and the top 70% of the sample achieved a mean score of 93.6%.

Student and Teacher Interviews

Interviews with teachers using the slides with students in public school programs were most positive, with some teachers indicating that even totally blind students were able to profit from information on the accompanying tapes. Teachers in residential and public school programs reported that students saw more through the viewer than the teachers expected they would. One enterprising teacher used an Apollo Electronic Visual Aid to project on a screen the view that a student should see. Once the student understood the task and the letters and structures were identified on the Apollo screen, the student was able to use the Micro-Slide-Viewer™. Another student with very low vision alternated between use of an overhead projector and the Micro-Slide-Viewer™.

One teacher who used the materials with nine low vision students reported that the taped content "has been excellent for all students." The major problem for several students was their limited background in science. Students had some trouble with the scientific vocabulary, which impeded independent

use of the materials. Spanish-speaking students experienced additional difficulties. For these students, small group discussions and presentations proved effective.

Students who participated in the evaluation were highly motivated. They provided a number of suggestions and observations in individual and group interviews:

1. When the Microslide™ units paralleled textbook assignments, students used them as overviews and/or summaries because of the brevity and conciseness of information presented on the tapes.
2. Students used a human torso in the classroom to identify organs of the respiratory and digestive systems as they listened to tapes related to these systems.
3. Totally blind students who had been through the Audio-Tutorial Reference Materials Cell Division program (Franks & Glass, 1980) recalled coiling of the chromosomes (Set 81).
4. Braille students requested that braille labels be placed on each unit to facilitate their independent use. A number of legally blind braille readers, who could not read the print letters, were able to see the slide views with the greatest figure-ground contrast.
5. Some low vision students used high intensity lighting with the Micro-Slide-Viewer™.
6. Several students who were not able to read or see letters and lines were able to find some structures on the slides. For confirmation, the teacher had students draw or sketch what they saw. Although

some of the sketches were poor, they indicated students were able to see some of the structures well enough to identify them from the taped descriptions.

7. Some students utilized a paperweight magnifier with the viewer, along with high intensity lighting. This application further improved ability to see letters and structures.
8. Some students who were color blind were able to use the slides and sketch structures they saw.
9. The major problems that low vision students had were related to darkness, dimness, or clutter, and to size of some of the letters and numbers.
10. All students liked the brevity of the units and the spelling out of scientific terms.
11. Students thought the diagrams included in the print units were helpful. They used magnifiers to study these diagrams.
12. One student suggested that sketches--about twice the size of the Microslide™ view--be made of each slide.

Summary

The Microslide Cassette materials adapted by the American Printing House for the Blind can be successfully utilized by most visually handicapped students enrolled in life science courses. Braille readers also have found the materials valuable for the recorded information alone. As audio-tutorial reference materials, the Microslide Cassette Programs provide visually handicapped students in life science classes a self-instructional resource with a high degree of visual legibility.

References

Franks, F. L., (Ed.). APH meeting on needs of blind students in science. Louisville, Ky.: American Printing House for the Blind, 1980.

Franks, F. L., & Glass, R. D. Audio-tutorial reference materials in biology (cell division): Final report (Grant No. SP179-08277). Louisville, Ky.: American Printing House for the Blind, 1980.